IN THE CLAIMS

1. (Previously amended) A method for use in a wireless communication system, comprising the step of:

transmitting at least one of an uplink access signal and an uplink timing synchronization signal from a mobile station of the system to a base station of the system, wherein the at least one signal is from a signal set which includes a plurality of orthogonal signals, such that different timing and access signals from the mobile station and at least one other mobile station of the system are received at the base station orthogonal to one another over a base station sample window.

2. (Original) The method of claim 1 wherein the wireless system comprises an orthogonal frequency division multiplexed (OFDM) system.

3. (Original) The method of claim 1 wherein the signal set comprises a plurality of multitone signals, each of at least a subset of the multitone signals comprising a linear combination of tones whose baseband frequencies are integer multiples of *1/T*, where *T* is the base station sample window size.

4. (Original) The method of claim 3 wherein the sample window size *T* for the timing and access signals is the same as that used in the system for OFDM data symbols.

5. (Original) The method of claim 1 wherein each timing and access signal comprises a single multitone signal with different signals using non-overlapping subsets of tones, and further wherein the tones from all of the timing and access signals span the total available bandwidth.

6. (Original) The method of claim 5 wherein the multitone signals are transmitted with a cyclic prefix sufficiently large to cover multipath dispersion and pre-synchronization timing errors.

7. (Original) The method of claim 6 wherein the cyclic prefix is larger than a cyclic prefix used in data symbols transmitted from mobile stations that are already synchronized.

8. (Original) The method of claim 1 wherein a guard time of non-transmission is added to at least one of a beginning or an end of at least one of the timing and access signals to insure that the signal does not overrun into adjacent data symbols.

9. (Original) The method of claim 1 wherein during a particular timing and access interval, the base station takes a single T-length sample of a multitone timing and access signal, where T is the base station sample window size.

10. (Currently amended) The method of claim 1 wherein the base station sample window is located within a designated timing and access interval, ~~such that~~ such that, for all possible multipath signal arrival times, the sample window captures one T-period of the steady-state sinusoidal response to the multitone signal, where T is the base station sample window size.

11. (Original) The method of claim 1 wherein a base station timing and access sample window is synchronized with a data sample window of the base station.

12. (Original) The method of claim 1 wherein the mobile station computes a multitone timing and access signal using an inverse fast Fourier transform (IFFT) that is also used for data transmission.

13. (Original) The method of claim 1 wherein the mobile station pre-computes a multitone timing and access signal and stores it in a memory associated with the mobile station.

14. (Original) The method of claim 1 wherein each of at least a subset of the timing and access signals comprises a sequence of L multitone signals transmitted sequentially, with different timing and access signals using non-overlapping subsets of tones in each of L sample windows, and

further wherein the base station takes a T-length sample from each of the L multitone signals, where T is the base station sample window size.

15. (Previously amended) The method of claim 1 wherein at least a subset of the timing and access signals comprise multitone signals, and the coefficients of a given multitone signal are selected such that a cyclic autocorrelation of the signal at delays greater than a desired timing accuracy is sufficiently small.

16. (Original) The method of claim 1 wherein at least a subset of the timing and access signals comprise multitone signals, with a given multitone signal comprising contiguous tones, such that coefficient selection for the given multitone signal can be performed using a finite impulse response (FIR) filter design procedure.

17. (Original) The method of claim 16 wherein the FIR filter design procedure comprises a Chebychev polynomial design procedure.

18. (Original) The method of claim 1 wherein at least a subset of the timing and access signals comprise multitone signals, and wherein the tone frequencies of a given one of the multitone signals are spread throughout a designated frequency spectrum for purposes of frequency diversity.

19. (Previously amended) The method of claim 18 wherein the given multitone signal comprises groups of contiguous tones, with the groups of tones separated by an amount greater than a channel coherence bandwidth.

20. (Previously amended) The method of claim 1 wherein at least a subset of the timing and access signals comprise multitone signals, and wherein the coefficients of a given one of the multitone signals are selected such that a peak-to-average ratio of the signal is minimized.

21. (Original) The method of claim 1 wherein when the mobile station transmits a timing or access signal *u(t)*, the base station uses a maximum-likelihood (ML) estimator on the received signal *y(t)* to estimate an appropriate timing correction.

22. (Original) The method of claim 21 wherein in a multipath channel, the ML estimate is the time τ which maximizes the sum of the cross-correlation energies of *y(t)* with certain multipath components of *u(t)*.

23. (Currently amended) The method of claim 1 wherein ~~the~~ received signal power can be estimated in the base station by a measure of maximum total cross-correlation energy.

24. (Original) The method of claim 22 wherein the multipath components of *u(t)* are given as the eigenvectors of an average auto-correlation of the received signal, where the average is taken over the randomness in the multipath channel and the signal noise.

25. (Original) The method of claim 22 wherein the multipath components depend only on *u(t)* and can be pre-computed and stored by the base station.

26. (Original) The method of claim 22 wherein each cross-correlation of *y(t)* with a multipath component can be computed using a single inverse fast Fourier transform (IFFT).

27. (Currently amended) The method of claim 1 wherein the presence of a transmitted access signal *u(t)* can be detected by the base station when ~~the~~ estimated received signal power surpasses a pre-determined energy threshold.

28. (Original) The method of claim 27 wherein the threshold can be adjusted to trade off false access detection probability and missed detection probability.

29. (Original) The method of claim 27 wherein the threshold can be increased to ensure that access signals are received with sufficient energy to allow accurate timing estimates.

30. (Original) The method of claim 1 wherein when re-synchronizations are sufficiently frequent, the mobile station can combine timing corrections obtained from different re-synchronization intervals to average out timing estimation errors.

31. (Original) The method of claim 30 wherein the combining can be performed by linearly low-pass filtering timing estimates received from the base station.

32. (Original) The method of claim 1 wherein the mobile station is operative to clip timing corrections received from the base station.

33. (Original) The method of claim 32 wherein the mobile station clips the corrections by ignoring timing corrections greater than a threshold.

34. (Original) The method of claim 32 wherein the mobile station clips the corrections by accepting a timing correction which is larger than a threshold only if a certain number of large values are received in succession.

35. (Original) A mobile station system for use in a wireless communication system, the mobile station system being operative to transmit at least one of an uplink access signal and an uplink timing synchronization signal from a corresponding mobile station of the system to a base station of the system, wherein the at least one signal is from a signal set which includes a plurality of orthogonal signals, such that different timing and access signals from the mobile station and at least one other mobile station of the system are received at the base station orthogonal to one another over a base station sample window.

36. (Previously amended) An apparatus for use in a wireless communication system, the apparatus comprising:

means for transmitting at least one of an uplink access signal and an uplink timing synchronization signal from a mobile station of the system to a base station of the system, wherein the at least one signal is from a signal set which includes a plurality of orthogonal signals, such that different timing and access signals from the mobile station and at least one other mobile station of the system are received at the base station orthogonal to one another over a base station sample window; and

means for generating the at least one signal to be transmitted.

37. (Previously amended) A method for use in a wireless communication system, comprising the step of:

receiving at least one of an uplink access signal and an uplink timing synchronization signal in a base station of the system from a mobile station of the system, wherein the at least one signal is from a signal set which includes a plurality of orthogonal signals, such that different timing and access signals from the mobile station and at least one other mobile station of the system are received at the base station orthogonal to one another over a base station sample window.

38. (Previously amended) An apparatus for use in a wireless communication system, the apparatus comprising:

means for receiving at least one of an uplink access signal and an uplink timing synchronization signal in a base station of the system from a mobile station of the system, wherein the at least one signal is from a signal set which includes a plurality of orthogonal signals, such that different timing and access signals from the mobile station and at least one other mobile station of the system are received at the base station orthogonal to one another over a base station sample window; and

means for processing the received at least one signal.

39. (Original) A base station system for use in a wireless communication system, the base station system being operative to receive at least one of an uplink access signal and an uplink timing synchronization signal from a mobile station of the system, wherein the at least one signal is from a signal set which includes a plurality of orthogonal signals, such that different timing and access signals from the mobile station and at least one other mobile station of the system are received at a corresponding base station orthogonal to one another over a base station sample window.

40. (Canceled)
41. (Canceled)
42. (Canceled)
43. (Canceled)
44. (Canceled)
45. (Canceled)
46. (Canceled)
47. (Canceled)